

Correlated Behavior of Surface Topography and Corrosion of Brass in Pure Water

J.E.Castle and P.A. Zhdan
The School of Mechanical and Materials Engineering
The University of Surrey
Guildford
UK GU2 7XH

Abstract

Corrosion at the nano-thickness level is significant in the heat exchangers of power stations because of the subsequent transport of released copper throughout the steam/water circuit. One of the most significant factors determining the extent of corrosion is the level of dissolved oxygen. In the work to be described samples of admiralty brass have been exposed to pure water at 95°C at different oxygen levels: the oxygen level being monitored at very low concentrations by use of the oxygen reduction potential. (ORP). Curves of the measured release of copper and zinc as a function of pH value have been obtained for the range 8.5 -11.5.

All samples were characterized by measurement of the surface roughness using an AFM, as a function of exposure time and pH value. There is an excellent correlation between surface topography measured by surface roughness or by bearing volume and the concentration of metal ions in solution. This correlation is found in both reducing and in oxidizing conditions. The former is associated with surface etching and the latter with oxide growth and thus the same mechanism cannot be responsible for the observed correlation. This phenomenon will be discussed in terms of the processes determining concentration of soluble species at the metal-solution interface.

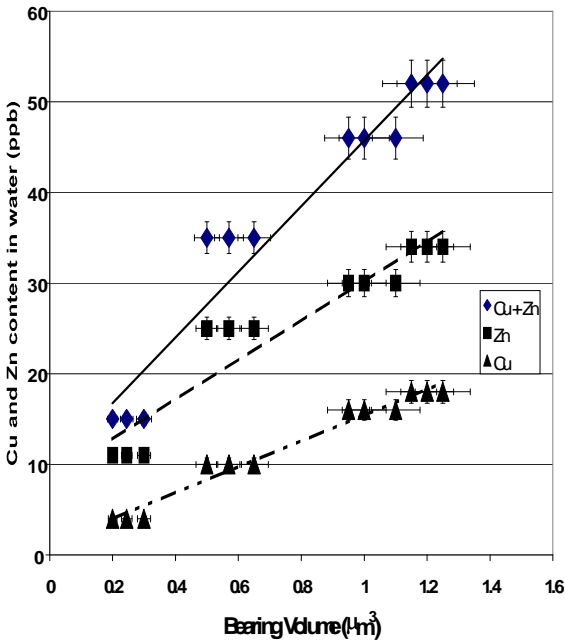


Figure. The relationship between copper and zinc pick-up by water and the bearing volume.